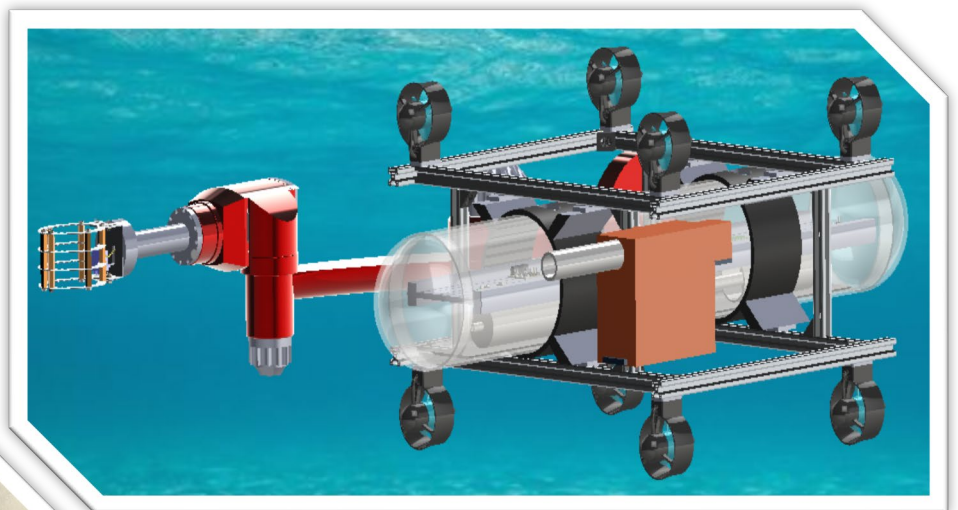


## Proposal Parts List

### *UTSA RowdySub Man-of-War 2024 Robosub International Competition*



Prepared by:

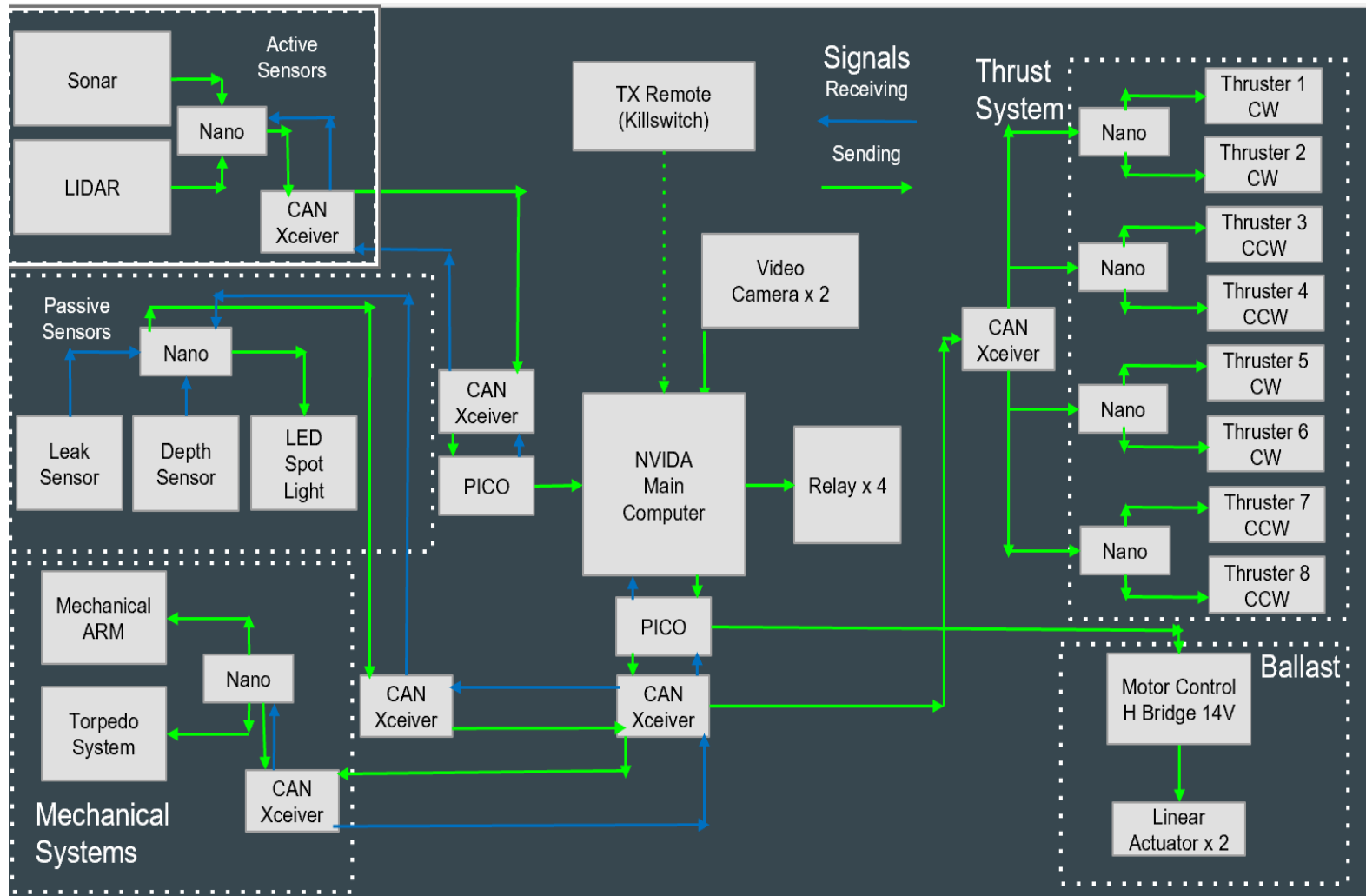
*Advanced Robotics  
at UTSA*

Item name	Qty	Cost	Link
Epoxy	1	\$8	<a href="https://a.co/d/ahxcQtq">https://a.co/d/ahxcQtq</a>
Standoffs	1	\$13	<a href="https://a.co/d/bEbywP3">https://a.co/d/bEbywP3</a>
Tether	1	\$15	<a href="https://a.co/d/erDXO6r">https://a.co/d/erDXO6r</a>
Thruster Motor CW	4	\$64	<a href="https://a.co/d/7LsN7ta">https://a.co/d/7LsN7ta</a>
Thruster Motor CCW	4	\$64	<a href="https://a.co/d/dKqasrJ">https://a.co/d/dKqasrJ</a>
Raspberry Pi Pico	1	\$28	<a href="https://a.co/d/i4piSYu">https://a.co/d/i4piSYu</a>
Pico Breakout Shield	1	\$16	<a href="https://a.co/d/8LHcOCV">https://a.co/d/8LHcOCV</a>
Arduino Nano	1	\$18	<a href="https://a.co/d/iBslOkX">https://a.co/d/iBslOkX</a>
Nano Shield	1	\$16	<a href="https://a.co/d/7rYBCxi">https://a.co/d/7rYBCxi</a>
Arduino Uno	1	\$27	<a href="https://a.co/d/0A8ONy7">https://a.co/d/0A8ONy7</a>
Nvidia Jetson Orin Nano	1	\$500	<a href="https://a.co/d/eFkF9Wu">https://a.co/d/eFkF9Wu</a>
Reservoir	1	\$7	<a href="https://a.co/d/0hOC1GP">https://a.co/d/0hOC1GP</a>
Linear Actuators	2	\$32	<a href="https://a.co/d/9IBrmj7">https://a.co/d/9IBrmj7</a>
Lipo Battery	1	\$99	<a href="https://a.co/d/cM0wlh2">https://a.co/d/cM0wlh2</a>
5 Voltage Converter	1	\$16	<a href="https://a.co/d/igVMxn9">https://a.co/d/igVMxn9</a>
Buck Converter	1	\$17	<a href="https://a.co/d/8ZdvLRP">https://a.co/d/8ZdvLRP</a>
Emergency Failure Switch	1	\$12	<a href="https://a.co/d/0y8uMwz">https://a.co/d/0y8uMwz</a>
Lipo Charger	1	\$44	<a href="https://a.co/d/c73QaxV">https://a.co/d/c73QaxV</a>
H-Bridge	1	\$9	<a href="https://a.co/d/7D3QwsN">https://a.co/d/7D3QwsN</a>
12 PWM Motor Driver	1	\$14	<a href="https://a.co/d/5tzU1cF">https://a.co/d/5tzU1cF</a>
Power Switch	1	\$7	<a href="https://a.co/d/e1yi8C7">https://a.co/d/e1yi8C7</a>

Kill Switch Remote	1	\$37	<a href="https://a.co/d/8fMWZzr">https://a.co/d/8fMWZzr</a>
TxRx Remote control	1	\$40	<a href="https://a.co/d/gq3xwEo">https://a.co/d/gq3xwEo</a>
Antenna Jack	1	\$6	<a href="https://a.co/d/iz4CHqn">https://a.co/d/iz4CHqn</a>
Antenna Cable	1	\$9	<a href="https://a.co/d/15hS032">https://a.co/d/15hS032</a>
Hookup power wire	1	\$17	<a href="https://a.co/d/0cODMyU">https://a.co/d/0cODMyU</a>
Hookup signal wire	1	\$17	<a href="https://a.co/d/2q8Kaqh">https://a.co/d/2q8Kaqh</a>
Video Amplifier	1	\$110	<a href="https://a.co/d/82HjWui">https://a.co/d/82HjWui</a>
Terminal Block	1	\$12	<a href="https://a.co/d/cynj8ID">https://a.co/d/cynj8ID</a>
Arduino Nano Cables	1	\$7	<a href="https://a.co/d/dYjQvhC">https://a.co/d/dYjQvhC</a>

Nvidia HDMI cable	1	\$10	<a href="https://a.co/d/02olmQm">https://a.co/d/02olmQm</a>
HDMI to USB cable Adapter	1	\$10	<a href="https://a.co/d/60x8onT">https://a.co/d/60x8onT</a>
microSD card for Nvidia	1	\$20	<a href="https://a.co/d/9P5yuxJ">https://a.co/d/9P5yuxJ</a>
microSD card for Raspberry Pi	1	\$15	<a href="https://a.co/d/6mtH2qS">https://a.co/d/6mtH2qS</a>
Remote Display	1	\$60	<a href="https://a.co/d/fndMGrv">https://a.co/d/fndMGrv</a>
Camera	3	\$39	<a href="https://a.co/d/924VXMo">https://a.co/d/924VXMo</a>
Electrical terminal kit	1	\$15	<a href="https://a.co/d/dfPNQXj">https://a.co/d/dfPNQXj</a>
Heat shrink kit	1	\$10	<a href="https://a.co/d/9C6EQN1">https://a.co/d/9C6EQN1</a>
Heat Gun	1	\$17	<a href="https://a.co/d/9FbPo44">https://a.co/d/9FbPo44</a>
Fuse Box	1	\$21	<a href="https://a.co/d/57GMxKf">https://a.co/d/57GMxKf</a>
Sanding tool kit	1	\$10	<a href="https://www.homedepot.com/p/Gator-2-5-8-in-x-5-in-Hook-and-Loop-Premium-Multi-Surface-Sanding-Tool-Assorted-Grit-Kit-7225/318572602">https://www.homedepot.com/p/Gator-2-5-8-in-x-5-in-Hook-and-Loop-Premium-Multi-Surface-Sanding-Tool-Assorted-Grit-Kit-7225/318572602</a>
Linear Solenoid	2	\$46	<a href="https://www.mcmaster.com/70155K112-70155K631/">https://www.mcmaster.com/70155K112-70155K631/</a>
Torpedo Toys	2	\$8	<a href="https://www.walmart.com/ip/Water-Torpedo-Rocket-4-Pcs-Underwater-Torpedo-Rocket-Throwing-Swimming-Diving-Game-Summer-Toy-Torpedo-Rocket-Toy/937583333?athbdg=L1700&amp;from=/search">https://www.walmart.com/ip/Water-Torpedo-Rocket-4-Pcs-Underwater-Torpedo-Rocket-Throwing-Swimming-Diving-Game-Summer-Toy-Torpedo-Rocket-Toy/937583333?athbdg=L1700&amp;from=/search</a>
PVC pipe	1	\$5	<a href="https://www.homedepot.com/p/IPEX-1-1-2-in-x-24-in-Rigid-PVC-Schedule-40-DWV-Pipe-022015/202300503">https://www.homedepot.com/p/IPEX-1-1-2-in-x-24-in-Rigid-PVC-Schedule-40-DWV-Pipe-022015/202300503</a>
Depth/Pressure/ Temperature sensor	1	\$85	<a href="https://bluerobotics.com/store/sensors-sonars-cameras/sensors/bar30-sensor-r1/">https://bluerobotics.com/store/sensors-sonars-cameras/sensors/bar30-sensor-r1/</a>
Leak detection sensor	1	\$32	<a href="https://bluerobotics.com/store/sensors-sonars-cameras/leak-sensor/sos-leak-sensor/">https://bluerobotics.com/store/sensors-sonars-cameras/leak-sensor/sos-leak-sensor/</a>
Leak sensor tips	1	\$8	<a href="https://bluerobotics.com/store/sensors-sonars-cameras/leak-sensor/sos-probe-tips/">https://bluerobotics.com/store/sensors-sonars-cameras/leak-sensor/sos-probe-tips/</a>
Ping Sonar	1	\$410	<a href="https://bluerobotics.com/store/sensors-sonars-cameras/sonar/ping-sonar-r2-rp/">https://bluerobotics.com/store/sensors-sonars-cameras/sonar/ping-sonar-r2-rp/</a>
USB to TTL Serial adapter	1	\$50	<a href="https://bluerobotics.com/store/comm-control-power/tether-interface/bluart-r1-rp/">https://bluerobotics.com/store/comm-control-power/tether-interface/bluart-r1-rp/</a>
I2C Bus Splitter	1	\$14	<a href="https://bluerobotics.com/store/comm-control-power/tether-interface/i2c-bus-splitter/">https://bluerobotics.com/store/comm-control-power/tether-interface/i2c-bus-splitter/</a>
I2C Logic Converter	1	\$7	<a href="https://a.co/d/5dwwd59">https://a.co/d/5dwwd59</a>
LIDAR	1	\$99	<a href="https://a.co/d/8HLpqK4">https://a.co/d/8HLpqK4</a>
Proximity sensors	1	\$9	<a href="https://a.co/d/dMGXr8U">https://a.co/d/dMGXr8U</a>
IMU	1	\$33	<a href="https://a.co/d/aPJRcbN">https://a.co/d/aPJRcbN</a>
LED Navigation light	1	\$21	<a href="https://a.co/d/3cILX4P">https://a.co/d/3cILX4P</a>
<b>Total Number of Items</b>	<b>66</b>		
<b>Total</b>	<b>\$2,883</b>		

## Electrical Block Diagram



## Physical Body



*Name:* Epoxy

*Description:* A epoxy that is waterproof and works with metals and plastics.

*Quantity:* 1

*Cost:* \$8.31



*Name:* Standoffs

*Description:* Spacer, screw, nut, stand-off assortment kit of alloy steel material.

*Quantity:* 1

*Cost:* \$12.99



*Name:* Tether

*Description:* This heavy-duty waterproof tether has a tensile strength of 2,000 lbs, is 20 ft long, floats, and will be used as a harness for weighing and recovery of the AUV.

*Quantity:* 1

*Cost:* \$14.39

## Underwater Thrusters



*Name:* Underwater Thrusters (Clockwise direction (CW))

*Description:* Waterproof, bi-directional, with 12V of thrust including an electronic speed controller and screws.

*Quantity:* 4 (Clockwise)

*Cost:* \$64.00 each



*Name:* Underwater Thrusters (Counterclockwise direction (CCW))

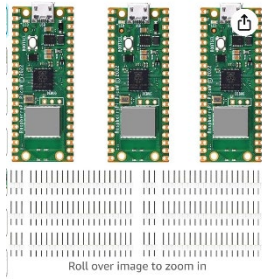
*Description:* Waterproof, bi-directional, with 12V of thrust including an electronic speed controller and screws.

*Quantity:* 4 (Counterclockwise)

*Cost:* \$64.00 each



## Computer System



*Name:* Raspberry Pi Pico

*Description:* AUV microcomputer to handle all sensor data and has an operating voltage of 5V. The Raspberry Pi pico has 40 pins and a micro-USB type input port.

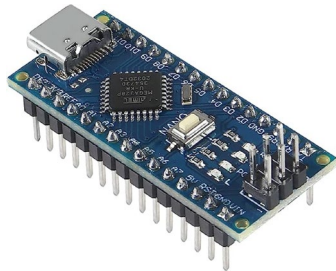
*Quantity:* 1 (3pcs)      *Cost:* \$28



*Name:* Raspberry Pi Breakout board

*Description:* The raspberry pi breakout board has 4, 10-pin terminal blocks.

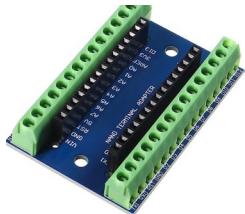
*Quantity:* 1 (2 pcs)      *Cost:* \$15.99



*Name:* Arduino Nano

*Description:* Microcontroller for AUV with a Type-C USB connection. The Arduino nano has an input voltage of 7-12 V and an operating voltage of 5V. The Arduino nano will control all motors.

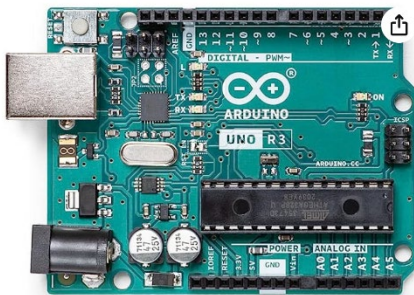
*Quantity:* 1 (4 pcs)      *Cost:* \$17.99



*Name:* Arduino Nano breakout board

*Description:* The Arduino nano board requires an Arduino breakout board. The breakout board has 30 pins.

*Quantity:* 1 (10 pcs)      *Cost:* \$16.29



*Name:* Arduino Uno

*Description:* An Arduino Uno is needed for basic prototype testing. The Arduino Uno has an operating voltage of 5-10 V.

*Quantity:* 1      *Cost:* \$27.60



**Name:** Nvidia Jetson Orin Nano

**Description:** GPU on-board computer to handle image processing of AUV.

**Quantity:** 1      **Cost:** 499.99

## Buoyancy System



**Name:** Reservoir

**Description:** Syringe reservoir for water intake for the AUV buoyancy systems.

**Quantity:** 1 (2 pcs each)      **Cost:** \$6.98 each



**Name:** Linear Actuator

**Description:** Aluminum alloy linear actuator with a 6" stroke length and a maximum load of 150N. The linear actuator has a 12 V input voltage. The linear actuators will be used for the buoyancy system on the AUV.

**Quantity:** 2      **Cost:** \$31.97 each

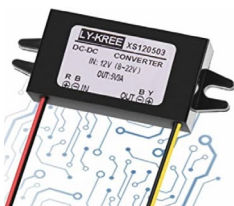
## Electronics



**Name:** Lipo Battery

**Description:** Rechargeable 4S, 7000mAh, 100C, 14.8 V Lithium Polymer batteries with an EC5 connector.

**Quantity:** 1 (2 pcs)      **Cost:** \$99.99



**Name:** 5V Voltage Converter

**Description:** 12V-5V voltage converter with an output current of 3A. This will step down 12V voltages to 5V for necessary components.

**Quantity:** 1 (3 pcs)      **Cost:** \$15.99



**Name:** Buck Converter

**Description:** This 6V-40V buck converter takes in large voltages and steps them down to voltages of 1.2-36V.

**Quantity:** 1 (2 pcs)    **Cost:** \$16.99



**Name:** Emergency Failure Switch

**Description:** 5V-48V power failure switch with a current draw of 10 A. This will automatically turn off the AUV in case of a power failure.

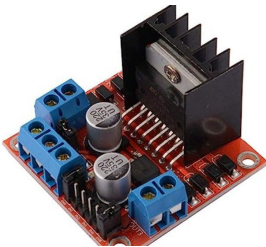
**Quantity:** 1 (2pcs)    **Cost:** \$11.99



**Name:** LiPo Balance Charger/Discharger

**Description:** 1S-6S LiPo balancer with an input voltage of 12V.

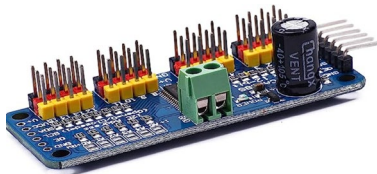
**Quantity:** 1    **Cost:** \$43.99



**Name:** Dual H Bridge Motor Controller

**Description:** The H bridge motor controller has a drive voltage of 5V-35V, a drive current of 2A, and provides a maximum power of 25W. This will be used to control the linear actuators for the AUV buoyancy system.

**Quantity:** 1 (2 pcs)    **Cost:** \$8.99



**Name:** 12-bit PWM motor driver

**Description:** Two-pin 16 PWM output channels controlled through I<sup>2</sup>C with an operating voltage of 5-10 V. This will be used to control the linear actuators for the AUV buoyancy system.

**Quantity:** 1 (4 pcs)    **Cost:** \$13.99





**Name:** Manual power switch

**Description:** Required manual power switch to shut off/on the AUV. The power failure switch operates with 12V.

**Quantity:** 1 (5pcs)    **Cost:** \$6.99



**Name:** Kill Switch Remote

**Description:** Wireless Remote controller has a 30A relay, an input voltage of 12V-72V, and a range of 4900 ft. This is to manually switch on/off the emergency failure switch.

**Quantity:** 1    **Cost:** \$36.99



**Name:** TxRx Remote Control

**Description:** 12 V 7A, 16 relay radiofrequency wireless receiver and transmitter with a remote-control distance of 98 ft-164 ft. This will allow the AUV to be remote controlled.

**Quantity:** 1    **Cost:** \$39.99



**Name:** Antenna Jack

**Description:** Antenna jack with dimensions of 3.39 inches in length, 2.17 inches in width, 0.35 inches in height, and a weight of 0.317 oz.

**Quantity:** 1 (10pcs)    **Cost:** \$6.49



**Name:** Antenna Cable

**Description:** 20-inch coaxial female-to-male antenna cable.

**Quantity:** 1 (2pcs)    **Cost:** \$9.99



**Name:** Hookup Power Wire

**Description:** 16 AWG wire consisting of 33 ft of red wire and 33 ft of black wire.

**Quantity:** 1    **Cost:** \$16.99



**Name:** Hookup Signal Wire

**Description:** Set of 6 colored 22 AWG cables of 26.25 ft in length and made from copper material.

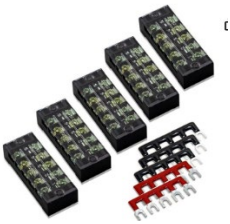
**Quantity:** 1      **Cost:** \$16.99



**Name:** Video Signal Amplifier

**Description:** 2.4 and 5.8G wifi dual band signal booster with an output power of 2000mW and an operating voltage range of 5-16V. The signal amplifier comes with one 2.5" USB adapter connection and one 2.5" JST adapter connection.

**Quantity:** 1      **Cost:** \$109.99



**Name:** Terminal Block

**Description:** These terminal strips allows for each power wire to connect to each source

**Quantity:** 1 (5 pcs)      **Cost:** \$12.49



**Name:** Arduino Nano Cables

**Description:** The Arduino nano board requires an Arduino nano cable for programming and as a power supply.

**Quantity:** 1 (6 pcs)      **Cost:** \$7.49



**Name:** HDMI Cable

**Description:** This is HDMI cable will allow for data to stream by the NVIDIA Jeston Orin Nano.

**Quantity:** 1      **Cost:** \$9.99



*Name:* HDMI to USB adapter

*Description:* This is HDMI to USB adapter allows for data to stream on the remote display by the NVIDIA Jetson Orin Nano.

*Quantity:* 1

*Cost:* \$9.99



*Name:* MicroSd Card for Nvidia

*Description:* This 128GB is required for operation of the Nvidia Jetson Orin Nano on-board computer.

*Quantity:* 1 (2 pcs)    *Cost:* \$20.69



*Name:* MicroSD card for Raspberry Pi

*Description:* This 128GB is required for the operation of the Raspberry Pi microcontroller.

*Quantity:* 1

*Cost:* \$14.99



*Name:* Remote Display

*Description:* This touchscreen external remote display will provide live camera feed of on-board AUV camera. It has a 7-inch screen and has a HDMI input.

*Quantity:* 1

*Cost:* \$59.99



*Name:* Camera

*Description:* This USB camera is for AUV image detection underwater. The camera is 8MP with a 3264H x 2448V resolution.

*Quantity:* 3

*Cost:* \$38.99



**Name:** Electrical terminal kit

**Description:** This wire connector kit comes with an assortment of different electrical connectors (160 pcs) with waterproof tubing.

**Quantity:** 1

**Cost:** \$14.99



**Name:** Heat Shrink Kit

**Description:** This heat shrink kit contains a variety of different tube lengths (300pcs) and is marine grade.

**Quantity:** 1

**Cost:** \$14.99

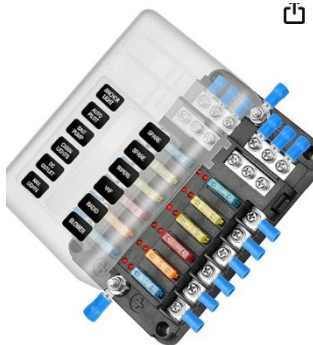


**Name:** Heat Gun

**Description:** This 380W heat gun comes with two variable speeds for heavy duty and light duty work.

**Quantity:** 1

**Cost:** \$16.99



**Name:** Fuse Box

**Description:** This fuse box notifies where a fuse has taken place in a large circuit with individual LEDs lighting up. The fuse box has 12 fuses to hook up to and requires an input voltage of 12V.

**Quantity:** 1

**Cost:** \$20.99

## Torpedo System

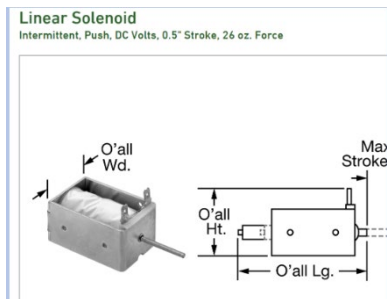


**Name:** Sanding Tool Kit

**Description:** This heat shrink kit contains a variety of different tube lengths (300pcs) and is marine grade.

**Quantity:** 1

**Cost:** \$9.98



**Name:** Linear Solenoid

**Description:** This 12V Linear Solenoid has a 0.5" stroke, 26 oz force and is made from steel material. This will fire the play toy torpedoes of the AUV.

**Quantity:** 2

**Cost:** \$46.36



**Name:** Torpedo Toy

**Description:** These toy torpedoes will be used by the AUV and have a weight of 155 g and made from plastic material.

**Quantity:** 2 (4 pcs)

**Cost:** \$7.94



**Name:** PVC Pipe

**Description:** PVC pipe for the torpedo system. The pipe is 2 inches in diameter and 2 inches in length.

**Quantity:** 1

**Cost:** \$5.76



## Input/Output Sensors



*Name:* Depth/Pressure/Temperature Sensor

*Description:* This waterproof depth and pressure sensor can measure up to 30 bar (300 m) with a depth resolution of 2mm. The sensor is made from anodized aluminum material and also has an inbuilt temperature sensor. The sensor requires an input voltage of 3.3V with a max of 5.5V.

*Quantity:* 1                      *Cost:* \$85



*Name:* Leak detection sensor

*Description:* The sensor blinks red when water is detected. The sensor has an operating voltage of 3.3V-5V and a maximum current draw of 20mA.

*Quantity:* 1                      *Cost:* \$32



*Name:* Leak sensor probe tips

*Description:* Extra leak detection probe tips for use on the leak detection sensor to replace worn out and damaged probes.

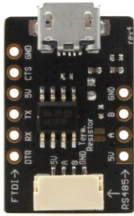
*Quantity:* 1 (20 pcs)      *Cost:* \$8.00



*Name:* Ping sonar

*Description:* This active sonar measures up to 100 m underwater and is an echo sounder. The sonar has an input voltage of 3.3V-5V and a current draw of 100mA. The sonar is housed in an aluminum enclosure.

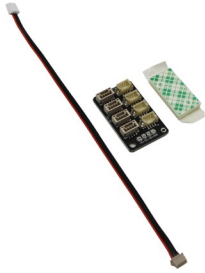
*Quantity:* 1                      *Cost:* \$410



**Name:** USB to TTL Serial Adapter

**Description:** This device allows for USB to serial communication through TTL or RS485 and has an input voltage of 3.3V-5V.

**Quantity:** 1                      **Cost:** \$50.00



**Name:** I<sup>2</sup>C Bus Splitter

**Description:** The I<sup>2</sup>C Bus Splitter has header pin holes, DF13 connectors, and JST-GH connectors to increase I<sup>2</sup>C connections on the same bus. The bus splitter comes with a DF-13 to JST-GH cable connector and double-sided foam tape.

**Quantity:** 1                      **Cost:** \$14



**Name:** I2C Logic Converter

**Description:** This bi-directional logic level converter steps down 5V to 3.3V and steps up 3.3V to 5V at the same time.

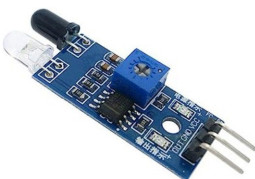
**Quantity:** 1 (10 pcs)      **Cost:** \$7.49



**Name:** LIDAR Sensor

**Description:** This LIDAR sensor requires a 12 V input and provides 360 degree scanning ability. This sensor will be used for far away object detection for the AUV.

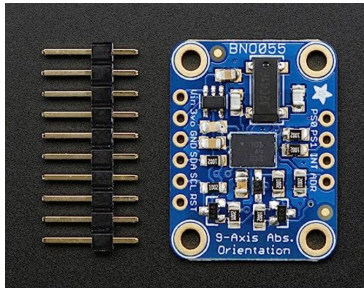
**Quantity:** 1                      **Cost:** \$99.00



**Name:** Proximity Sensor

**Description:** Infrared obstacle detection sensor with an operating voltage of 3.3-5V and obstacle avoidance range of 2-30 cm. White LED signals minimum detection and the black LED signals maximum detection.

**Quantity:** 1 (10 pcs)      **Cost:** \$8.79



**Name:** 9 DOF Accelerometer

**Description:** This sensor communicates using I<sup>2</sup>C and provides data such as absolute orientation, angular velocity, acceleration, magnetic field strength, linear acceleration, gravity, and temperature.

**Quantity:** 1

**Cost:** \$33.36



**Name:** Waterproof LED navigation light

**Description:** LED is 3 inches in diameter and requires a 12V input voltage.

**Quantity:** 1 (2 pcs)

**Cost:** \$20.59